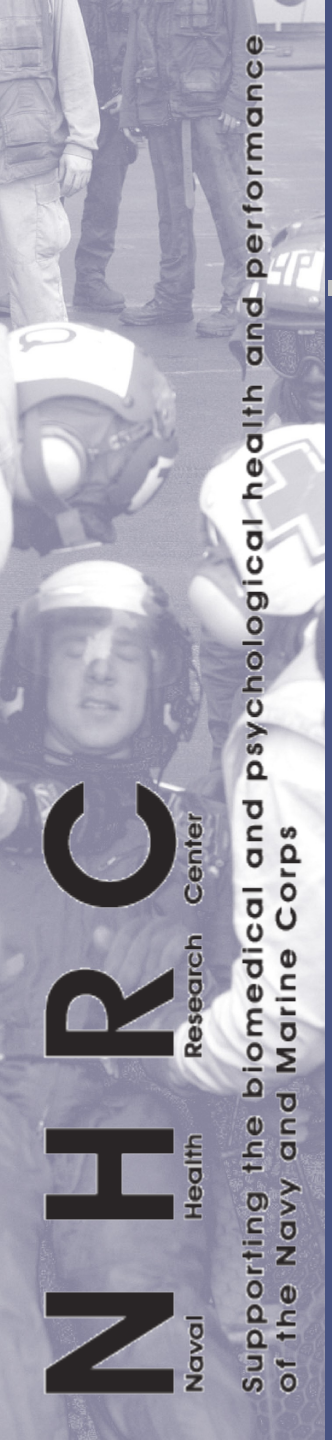
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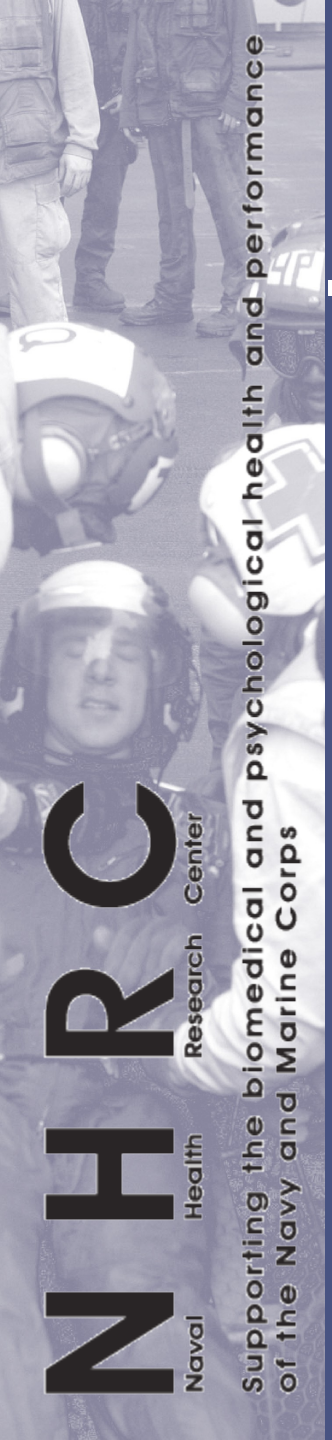
IMPLEMENTATION OF AN AUTOMATED HEAT STRESS SYSTEM (AHSS) ASHORE AND AFLOAT

Fleet Review
04 December 2003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HEAT STRESS GUIDANCE

- **OPNAVINST 5100.19D-CH1**
- **Manual of Preventive Medicine, P-5010**
- **MCO 6200.1E**

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MANUAL MEASUREMENT

RSS-220 Heat Stress Meter

AUTOMATED HEAT STRESS SYSTEM (AHSS)

- **Slot #1 - Reference Sensor**
- **Slot #2 - Dry Bulb Temperature**
- **Slot #3 - Relative Humidity**
- **Slot #4 - Globe Temperature**

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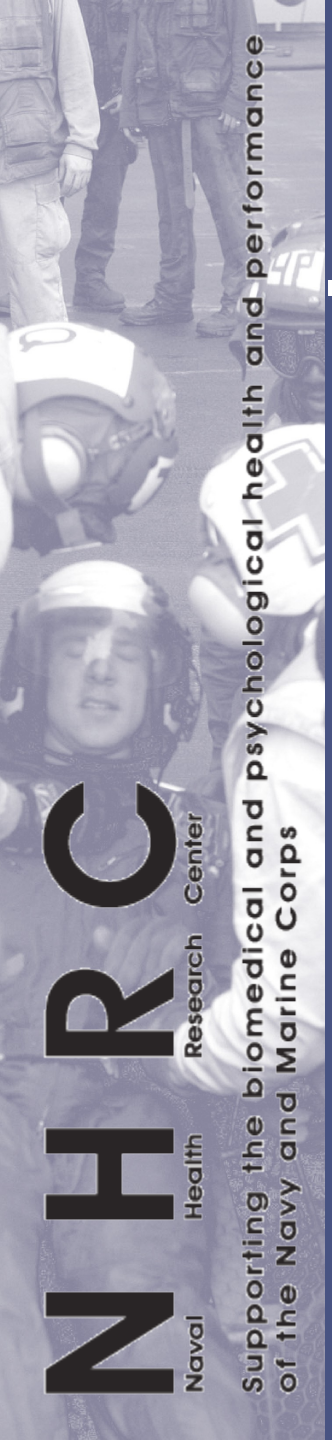
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AFLOAT

- First installation – 1998
- DDGs 72 – 88 completed, 89+ via ECP
  - 27 AHSS units in engineering / supply workspaces; saves 3300 man-hours per year
- LHDs 3, 5, & 7 completed, LHD-6 partial install
  - 46 AHSS units in engineering / supply workspaces; saves 4500 man-hours per year

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Shipboard AHSS unit

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AHSS unit with ventilation duct blowing air across the sensors (airflow not to exceed 600 fpm)

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Programming the AHSS unit with the Psion 5 mx

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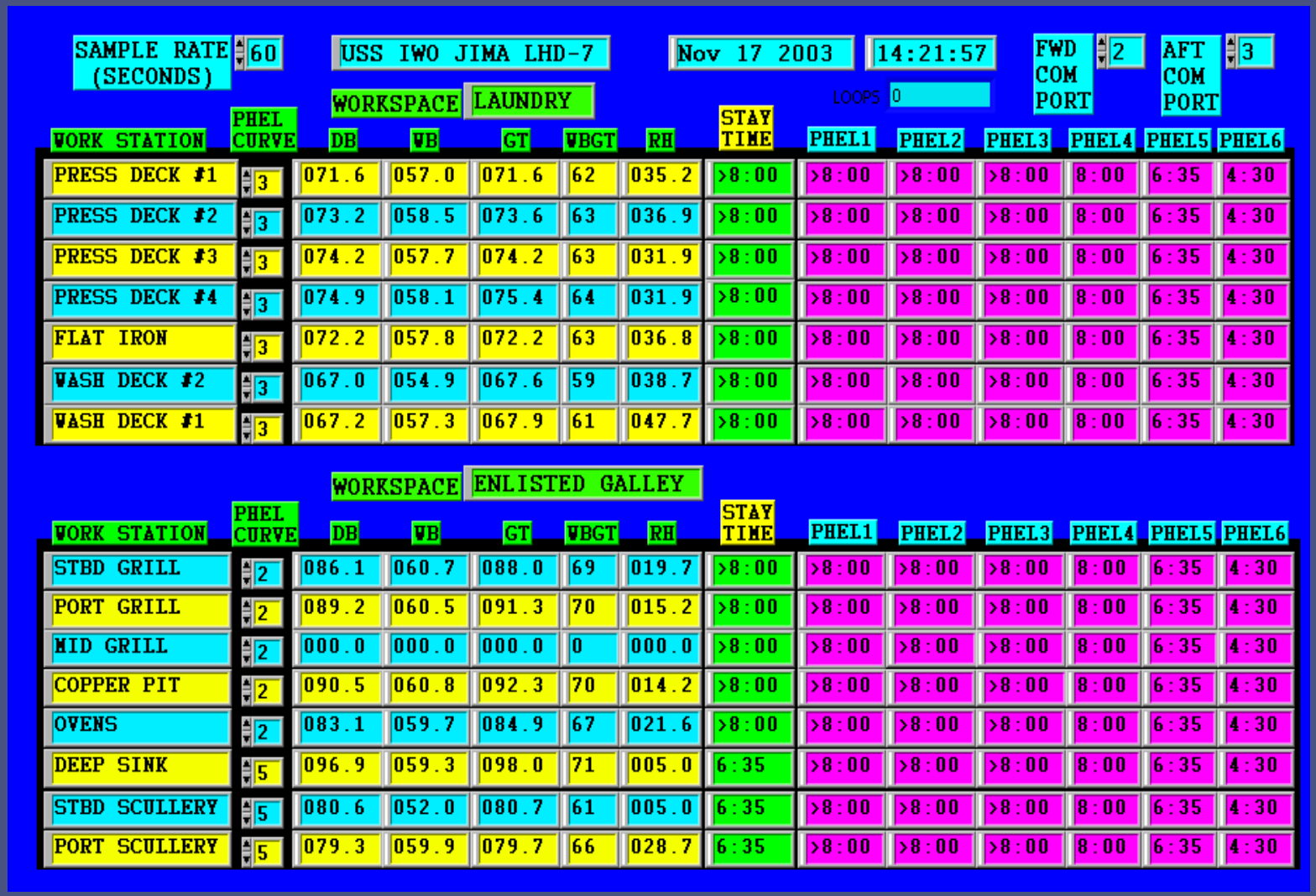
Calibrating the AHSS unit.

MEDICAL/SUPPLY SOFTWARE



SAMPLE RATE (SECONDS) 60 | USS IWO JIMA LHD-7 | Nov 17 2003 | 14:21:57 | FWD COM PORT 2 | AFT COM PORT 3

WORKSPACE LAUNDRY — LOOPS 0

WORK STATION	PHEL CURVE	DB	WB	GT	WBGT	RH	STAY TIME	PHEL1	PHEL2	PHEL3	PHEL4	PHEL5	PHEL6
PRESS DECK #1	3	071.6	057.0	071.6	62	035.2	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
PRESS DECK #2	3	073.2	058.5	073.6	63	036.9	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
PRESS DECK #3	3	074.2	057.7	074.2	63	031.9	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
PRESS DECK #4	3	074.9	058.1	075.4	64	031.9	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
FLAT IRON	3	072.2	057.8	072.2	63	036.8	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
WASH DECK #2	3	067.0	054.9	067.6	59	038.7	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
WASH DECK #1	3	067.2	057.3	067.9	61	047.7	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30

WORKSPACE ENLISTED GALLEY

WORK STATION	PHEL CURVE	DB	WB	GT	WBGT	RH	STAY TIME	PHEL1	PHEL2	PHEL3	PHEL4	PHEL5	PHEL6
STBD GRILL	2	086.1	060.7	088.0	69	019.7	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
PORT GRILL	2	089.2	060.5	091.3	70	015.2	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
MID GRILL	2	000.0	000.0	000.0	0	000.0	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
COPPER PIT	2	090.5	060.8	092.3	70	014.2	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
OVENS	2	083.1	059.7	084.9	67	021.6	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
DEEP SINK	5	096.9	059.3	098.0	71	005.0	6:35	>8:00	>8:00	>8:00	8:00	6:35	4:30
STBD SCULLERY	5	080.6	052.0	080.7	61	005.0	6:35	>8:00	>8:00	>8:00	8:00	6:35	4:30
PORT SCULLERY	5	079.3	059.9	079.7	66	028.7	6:35	>8:00	>8:00	>8:00	8:00	6:35	4:30

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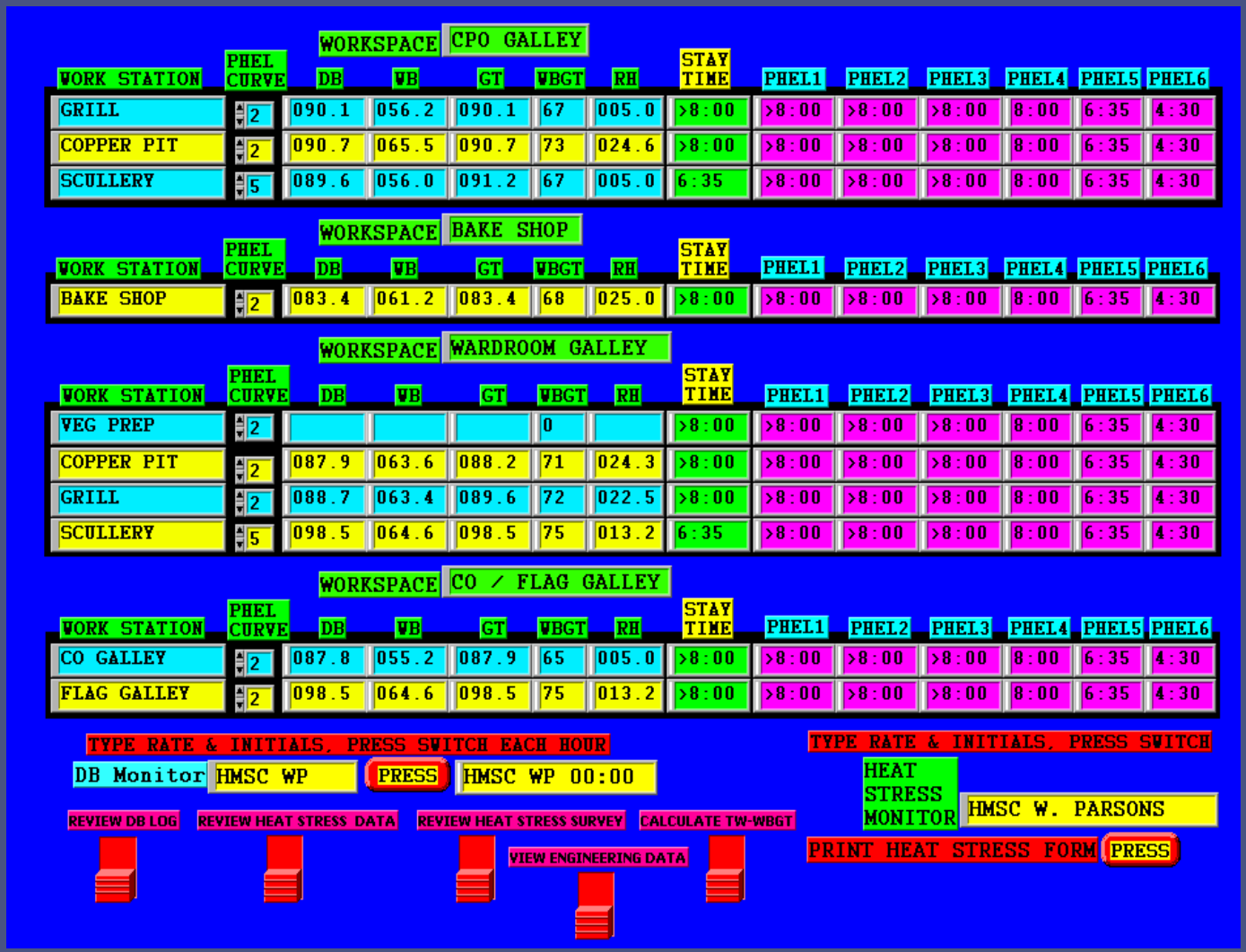
MEDICAL/SUPPLY SOFTWARE - CONT



WORKSPACE: CPO GALLEY

WORK STATION	PHEL CURVE	DB	WB	GT	WBGT	RH	STAY TIME	PHEL1	PHEL2	PHEL3	PHEL4	PHEL5	PHEL6
GRILL	2	090.1	056.2	090.1	67	005.0	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
COPPER PIT	2	090.7	065.5	090.7	73	024.6	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
SCULLERY	5	089.6	056.0	091.2	67	005.0	6:35	>8:00	>8:00	>8:00	8:00	6:35	4:30

WORKSPACE: BAKE SHOP

WORK STATION	PHEL CURVE	DB	WB	GT	WBGT	RH	STAY TIME	PHEL1	PHEL2	PHEL3	PHEL4	PHEL5	PHEL6
BAKE SHOP	2	083.4	061.2	083.4	68	025.0	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30

WORKSPACE: WARDROOM GALLEY

WORK STATION	PHEL CURVE	DB	WB	GT	WBGT	RH	STAY TIME	PHEL1	PHEL2	PHEL3	PHEL4	PHEL5	PHEL6
VEG PREP	2				0		>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
COPPER PIT	2	087.9	063.6	088.2	71	024.3	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
GRILL	2	088.7	063.4	089.6	72	022.5	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
SCULLERY	5	098.5	064.6	098.5	75	013.2	6:35	>8:00	>8:00	>8:00	8:00	6:35	4:30

WORKSPACE: CO / FLAG GALLEY

WORK STATION	PHEL CURVE	DB	WB	GT	WBGT	RH	STAY TIME	PHEL1	PHEL2	PHEL3	PHEL4	PHEL5	PHEL6
CO GALLEY	2	087.8	055.2	087.9	65	005.0	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
FLAG GALLEY	2	098.5	064.6	098.5	75	013.2	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30

TYPE RATE & INITIALS, PRESS SWITCH EACH HOUR

DB Monitor | HMSC WP | PRESS | HMSC WP 00:00

REVIEW DB LOG | REVIEW HEAT STRESS DATA | REVIEW HEAT STRESS SURVEY | CALCULATE TW-WBGT | VIEW ENGINEERING DATA

TYPE RATE & INITIALS, PRESS SWITCH

HEAT STRESS MONITOR | HMSC W. PARSONS

PRINT HEAT STRESS FORM | PRESS

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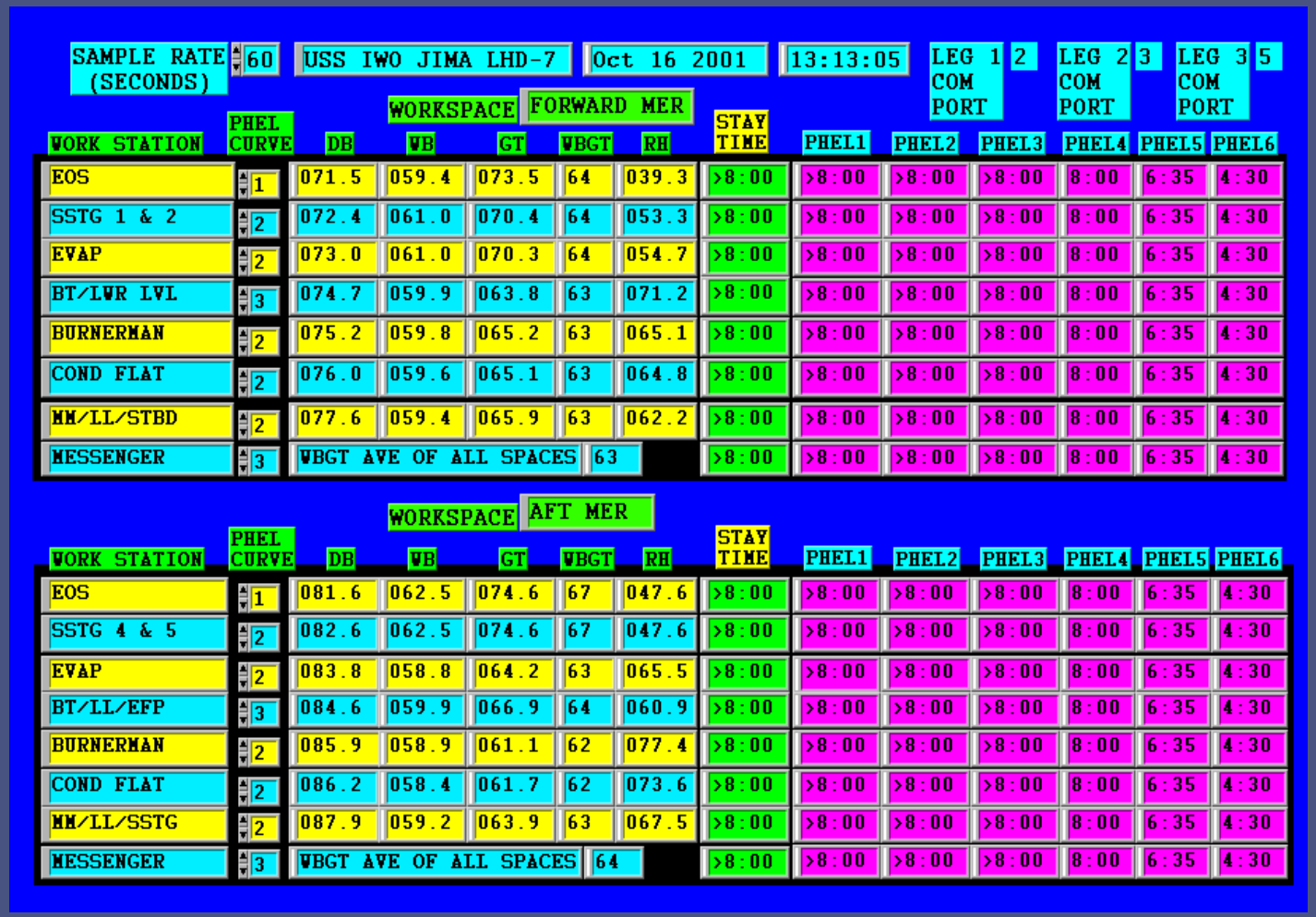
ENGINEERING SOFTWARE



SAMPLE RATE (SECONDS) 60 | USS IWO JIMA LHD-7 | Oct 16 2001 | 13:13:05 | LEG 1 COM PORT 2 | LEG 2 COM PORT 3 | LEG 3 COM PORT 5

WORKSPACE: FORWARD MER

WORK STATION	PHEL CURVE	DB	WB	GT	WBGT	RH	STAY TIME	PHEL1	PHEL2	PHEL3	PHEL4	PHEL5	PHEL6
EOS	1	071.5	059.4	073.5	64	039.3	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
SSTG 1 & 2	2	072.4	061.0	070.4	64	053.3	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
EVAP	2	073.0	061.0	070.3	64	054.7	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
BT/LWR LVL	3	074.7	059.9	063.8	63	071.2	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
BURNERMAN	2	075.2	059.8	065.2	63	065.1	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
COND FLAT	2	076.0	059.6	065.1	63	064.8	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
MM/LL/STBD	2	077.6	059.4	065.9	63	062.2	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
MESSENGER	3	WBGT AVE OF ALL SPACES			63		>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30

WORKSPACE: AFT MER

WORK STATION	PHEL CURVE	DB	WB	GT	WBGT	RH	STAY TIME	PHEL1	PHEL2	PHEL3	PHEL4	PHEL5	PHEL6
EOS	1	081.6	062.5	074.6	67	047.6	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
SSTG 4 & 5	2	082.6	062.5	074.6	67	047.6	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
EVAP	2	083.8	058.8	064.2	63	065.5	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
BT/LL/EFP	3	084.6	059.9	066.9	64	060.9	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
BURNERMAN	2	085.9	058.9	061.1	62	077.4	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
COND FLAT	2	086.2	058.4	061.7	62	073.6	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
MM/LL/SSTG	2	087.9	059.2	063.9	63	067.5	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
MESSENGER	3	WBGT AVE OF ALL SPACES			64		>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30

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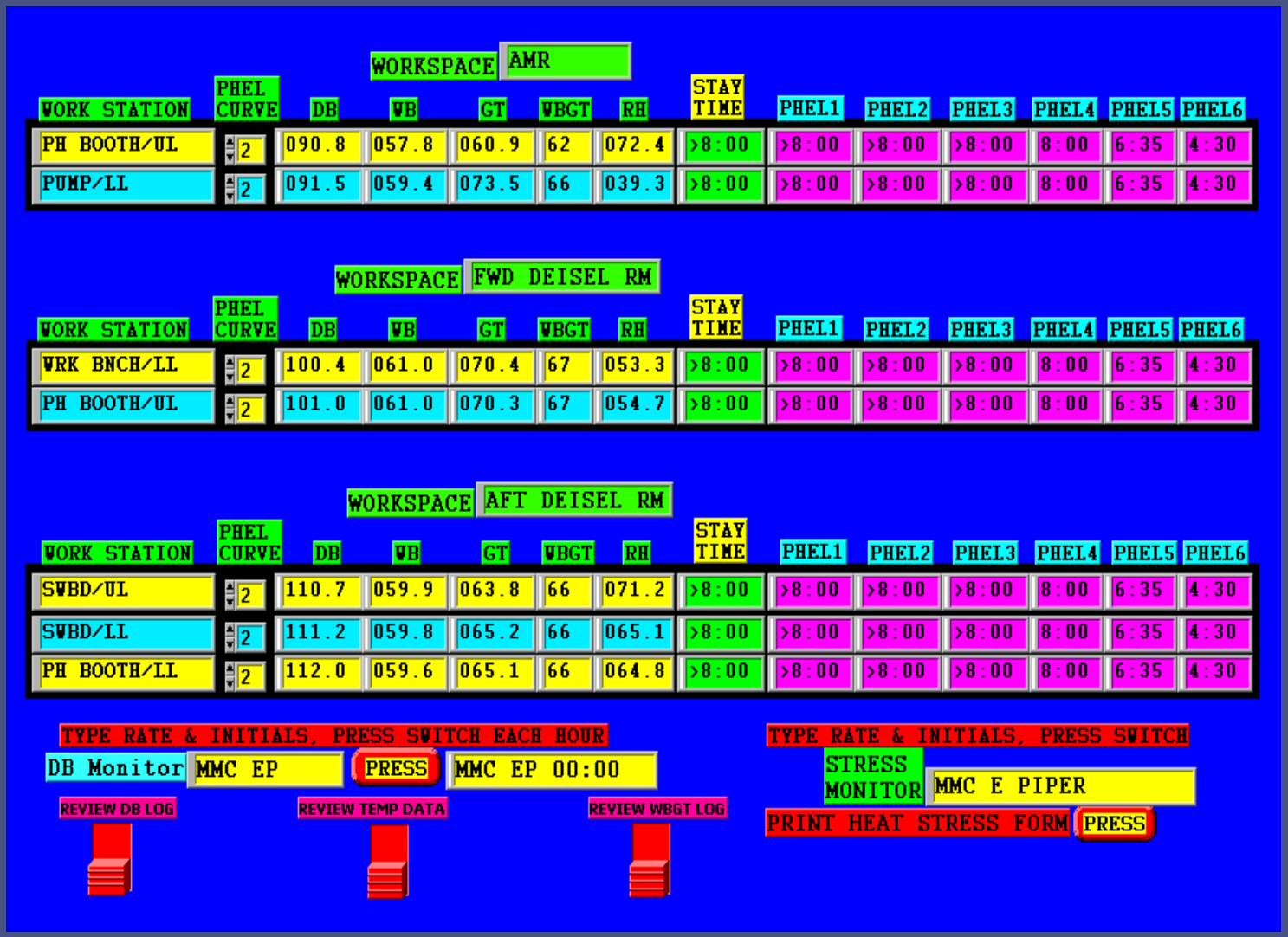
ENGINEERING SOFTWARE - CONT



WORKSPACE AMR

WORK STATION	PHEL CURVE	DB	WB	GT	WBGT	RH	STAY TIME	PHEL1	PHEL2	PHEL3	PHEL4	PHEL5	PHEL6
PH BOOTH/UL	2	090.8	057.8	060.9	62	072.4	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
PUMP/LL	2	091.5	059.4	073.5	66	039.3	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30

WORKSPACE FWD DEISEL RM

WORK STATION	PHEL CURVE	DB	WB	GT	WBGT	RH	STAY TIME	PHEL1	PHEL2	PHEL3	PHEL4	PHEL5	PHEL6
WRK BNCH/LL	2	100.4	061.0	070.4	67	053.3	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
PH BOOTH/UL	2	101.0	061.0	070.3	67	054.7	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30

WORKSPACE AFT DEISEL RM

WORK STATION	PHEL CURVE	DB	WB	GT	WBGT	RH	STAY TIME	PHEL1	PHEL2	PHEL3	PHEL4	PHEL5	PHEL6
SWBD/UL	2	110.7	059.9	063.8	66	071.2	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
SWBD/LL	2	111.2	059.8	065.2	66	065.1	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30
PH BOOTH/LL	2	112.0	059.6	065.1	66	064.8	>8:00	>8:00	>8:00	>8:00	8:00	6:35	4:30

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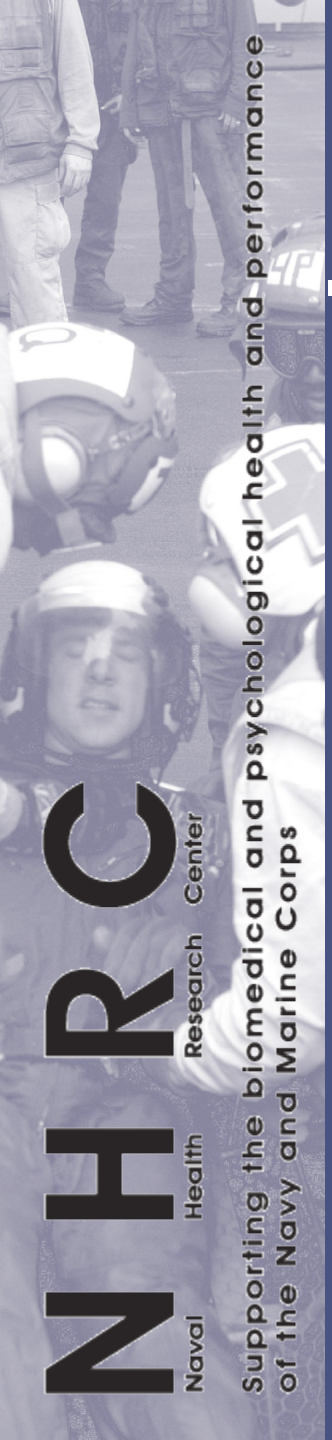
PRINTING A HEAT STRESS SURVEY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USS IWO JIMA LHD 7 **HEAT STRESS SURVEY**

SUPPLY WORKSPACES

DATE: Oct 16 2001 **TIME OF SURVEY:** 19:40

FOLLOW-ON SURVEY REQUIRED? YES ____ NO ____

IF YES, TIME ON NEXT SURVEY: _____

WORK STATION	LAUNDRY DB	WB	GT	WBGT	RH	PHEL CURVE	PHEL STAY TIMES P-1	P-2	P-3	P-4	P-5	P-6	DB > WB	GT ≥ DBFWD	GT > WB WB > WBGT
PRESS DK #1	063.7	059.9	063.8	61	071.2	1	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
PRESS DK #2	065.2	059.8	065.2	62	065.1	2	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
PRESS DK #3	065.0	059.6	065.1	62	064.8	3	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
PRESS DK #4	065.6	059.4	065.9	62	062.2	4	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
FLAT IRON	074.6	062.5	074.6	67	047.6	5	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
WASH DK #2	063.8	058.8	064.2	61	065.5	6	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
WASH DK #1	066.6	059.9	066.9	62	060.9	7	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y

WORK STATION	ENLISTED GALLEY DB	WB	GT	WBGT	RH	PHEL CURVE	P-1	P-2	P-3	P-4	P-5	P-6	DB > WB	GT ≥ DB	GT > WB WB > WBGT
STBD GRILL	074.6	062.5	074.6	67	047.6	8	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
PORT GRILL	063.8	058.8	064.2	61	065.5	9	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
MID GRILL	066.6	059.9	066.9	62	060.9	10	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
COPPER PIT	060.9	058.9	061.1	60	077.4	11	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
OVENS	061.2	058.4	061.7	60	073.6	12	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
DEEP SINK	063.9	059.2	063.9	61	067.5	13	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
STBD SCULLERY	060.8	057.8	060.9	59	072.4	14	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
PORT SCULLERY	073.5	059.4	073.5	64	039.3	15	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y

	CPO GALLEY DB	WB	GT	WBGT	RH	PHEL CURVE	P-1	P-2	P-3	P-4	P-5	P-6	DB > WB	GT ≥ DB	GT > WB WB > WBGT
GRILL	070.4	061.0	070.4	64	053.3	16	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
COPPER PIT	070.0	061.0	070.3	64	054.7	17	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
SCULLERY	060.9	058.9	061.1	60	077.4	18	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y

AHSS – PRINTING HSS - CONT

	BAKE SHOP DB	WB	GT	WBGT	RH	PHEL CURVE	P-1	P-2	P-3	P-4	P-5	P-6	DB > WB	GT ≥ DB	GT > WB > WBGT
BAKE SHOP	061.2	058.4	061.7	60	073.6	19	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y

	WARDROOM GALLEY DB	WB	GT	WBGT	RH	PHEL CURVE	P-1	P-2	P-3	P-4	P-5	P-6	DB > WB	GT ≥ DB	GT > WB > WBGT
VEG PREP AREA	063.9	059.2	063.9	61	067.5	20	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
COPPER PIT	060.8	057.8	060.9	59	072.4	21	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
GRILL	073.5	059.4	073.5	64	039.3	22	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
	070.4	061.0	070.4	64	053.3	23	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y

	CO / FLAG GALLEY DB	WB	GT	WBGT	RH	PHEL CURVE	P-1	P-2	P-3	P-4	P-5	P-6	DB > WB	GT ≥ DB	GT > WB > WBGT
CO GALLEY	066.6	059.9	066.9	62	060.9	24	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y
FLAG GALLEY	060.9	058.9	061.1	60	077.4	25	>8:00	>8:00	>8:00	8:00	6:35	4:30	Y	Y	Y

WBGT = DB * .1 + WB * .7 + GT *.2

COMMENTS

_____

_____

_____

_____

MONITOR QUESTIONS:

1. WAS DRINKING WATER AVAILABLE?
   YES ____ NO ____

2. WAS LAGGING IN GOOD WITH NONE MISSING OR TORN?
   YES ____ NO ____

3. WERE STEAM OR WATER PIPING INTACT WITH NO LEAKS PRESENT?
   YES ____ NO ____

WCS QUESTION:

1. DO ALL STAY TIMES EXCEED THE WATCH ROTATION?
   YES ____ NO ____

Submitted by: HMSC W. PARSONS _____ XO _____

Reviewed by: _____ SMO _____ CO _____

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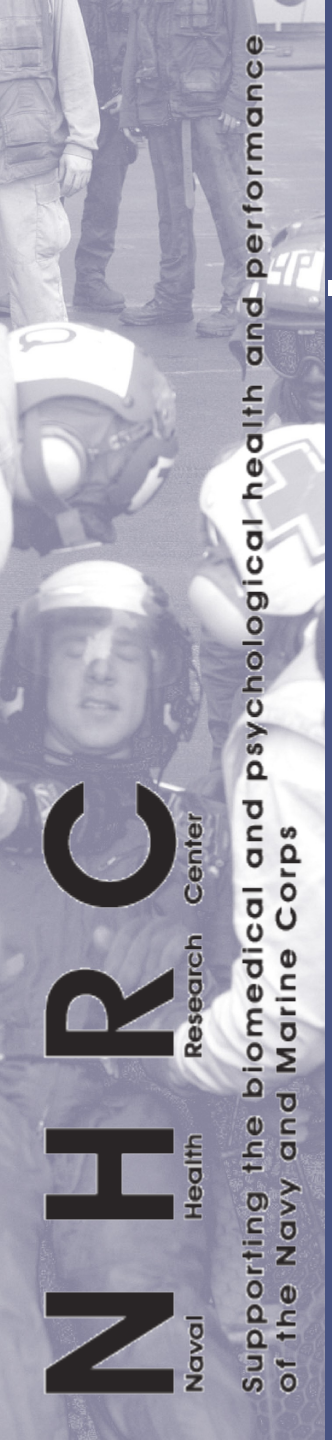
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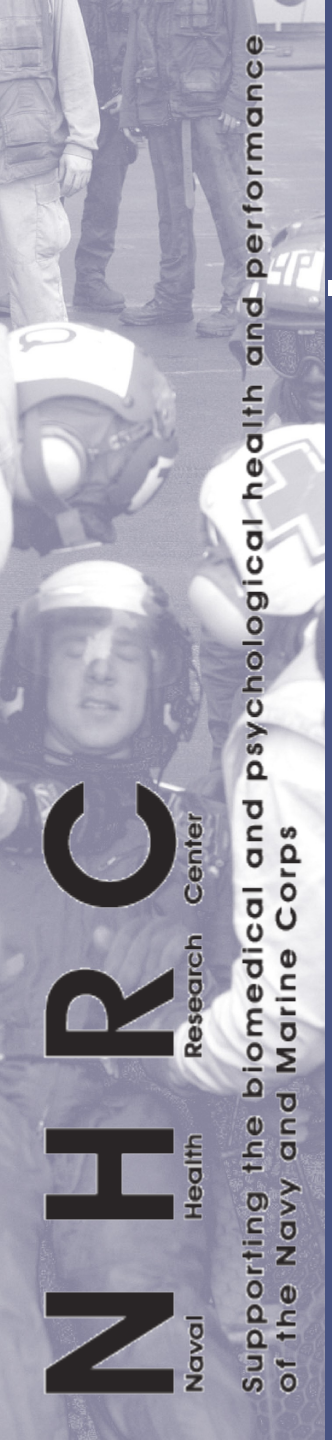
ASHORE

SAME AHSS UNIT USED ALOAT AND ASHORE

- First installation – June 2002
- MCRD - San Diego, CA
- 3rd FSSG – Okinawa, Japan
- USNH – Okinawa, Japan
- Marine Logistics Base, Albany, GA
- NEPMU2 – Norfolk, VA
- USMC Camp Lejeune – NC, 7 locations
- USNH Cherry Point, NC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ASHORE

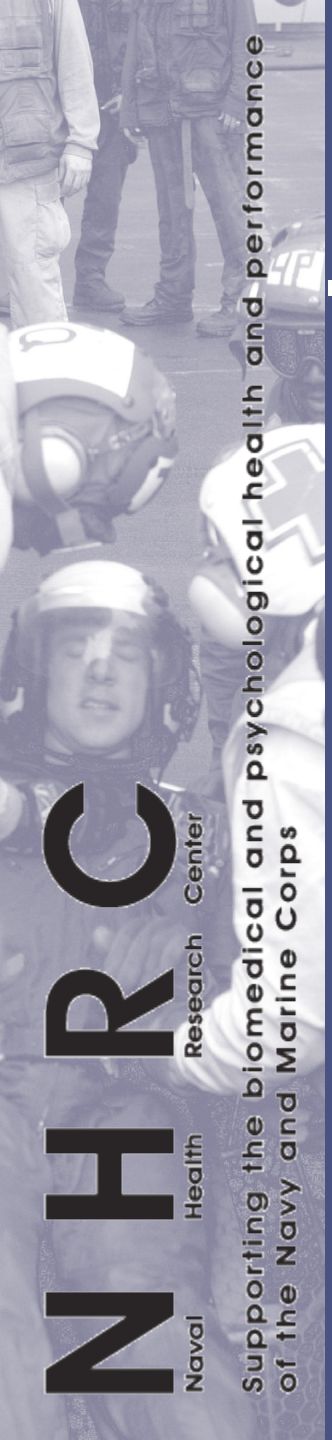
- USNH Corpus Christi -TX
- NAS Kingsville – TX
- Naval Station Ingleside – TX
- NAS Fort Worth - TX

WEATHER ENCLOSURE

Globe exposed to Measure radiant heat

AHSS unit protected from rain, wind etc.

Fan draws outside air across DB and RH sensor inside the


NHRC
Naval Health Research Center
Supporting the biomedical and psychological health and performance of the Navy and Marine Corps

AHSS ASHORE Software

- Next 5 slides show computer display screen for Flag Condition.
- Display updated every minute, stored every hour.
- Stored files (Excel .XLS type) can be reviewed.
- Current min data sent to L:\ and can be viewed by personnel with access to

US MARINE CORPS RECRUIT DEPOT SAN DIEGO

FLAG CONDITION

MCRDSD=1

MCRDSD

COM PORT

2

LOCATION=1

S3

SAMPLE RATE

SECONDS 60

CURRENT DATE

Jul 04 2002

CURRENT TIME

00:00:00

LOCATION MONITORED

S3 OFFICE

DB	WB	GT	RH	WBGT	FLAG CONDITION
068.6	058.3	068.6	048.0	61.4	NO FLAG

NO FLAG

TYPE RATE & INITIALS, PRESS SWITCH

SSGT SA

PRESS

SSGT SA 00:00

VIEW FLAG DATA

PUSH SWITCH TO VIEW HISTORICAL DATA

LOOPS 0

US MARINE CORPS RECRUIT DEPOT SAN DIEGO

FLAG CONDITION

MCRDSD=1

MCRDSD

COM PORT

3

LOCATION=1

S3

SAMPLE RATE

SECONDS 60

CURRENT DATE

Jul 16 2002

CURRENT TIME

18:38:25

LOCATION MONITORED

S3 OFFICE

DB	WB	GT	RH	WBGT	FLAG CONDITION
87.0	76.0	98.0	60.9	81.5	GREEN

TYPE RATE & INITIALS, PRESS SWITCH

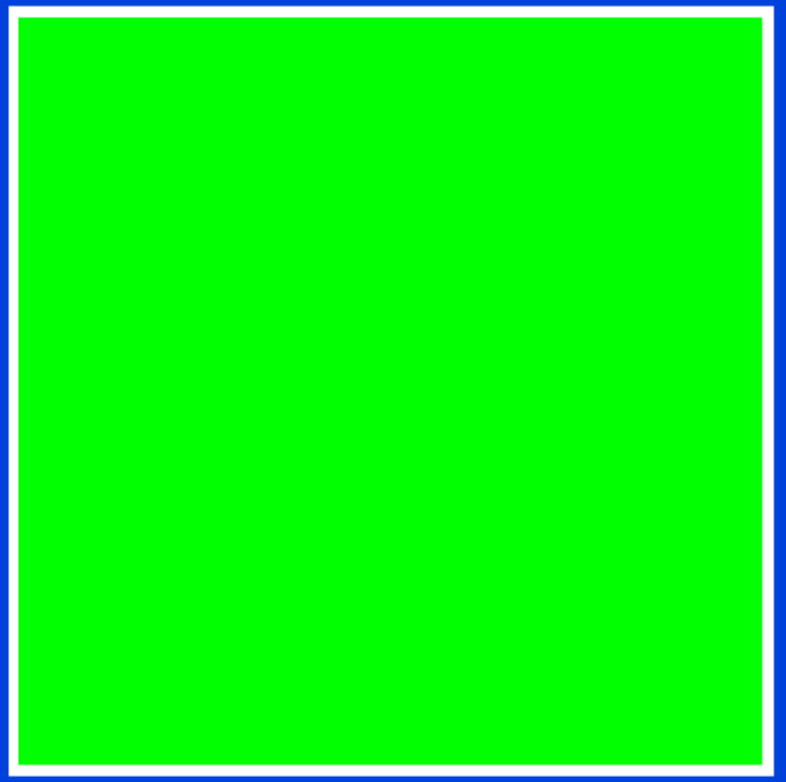
SSGT SA

PRESS

SSGT SA 00:00

VIEW FLAG DATA

PUSH SWITCH TO VIEW HISTORICAL DATA



LOOPS 30

US MARINE CORPS RECRUIT DEPOT SAN DIEGO

FLAG CONDITION

MCRDSD=1

MCRDSD

COM PORT

3

LOCATION=1

S3

SAMPLE RATE

SECONDS 60

CURRENT DATE

Jul 16 2002

CURRENT TIME

18:41:18

LOCATION MONITORED

S3 OFFICE

DB	WB	GT	RH	WBGT	FLAG CONDITION
93.0	80.0	110.0	57.3	87.3	YELLOW

TYPE RATE & INITIALS, PRESS SWITCH

SSGT SA

PRESS

SSGT SA 00:00

VIEW FLAG DATA

PUSH SWITCH TO VIEW HISTORICAL DATA

LOOPS 21

US MARINE CORPS RECRUIT DEPOT SAN DIEGO

MCRDSD=1

MCRDSD

COM PORT

3

FLAG CONDITION

LOCATION=1

S3

SAMPLE RATE

SECONDS 60

CURRENT DATE

Jul 16 2002

CURRENT TIME

18:42:41

LOCATION MONITORED

S3 OFFICE

DB	WB	GT	RH	WBGT	FLAG CONDITION
97.0	82.0	110.0	53.4	89.1	RED

TYPE RATE & INITIALS, PRESS SWITCH

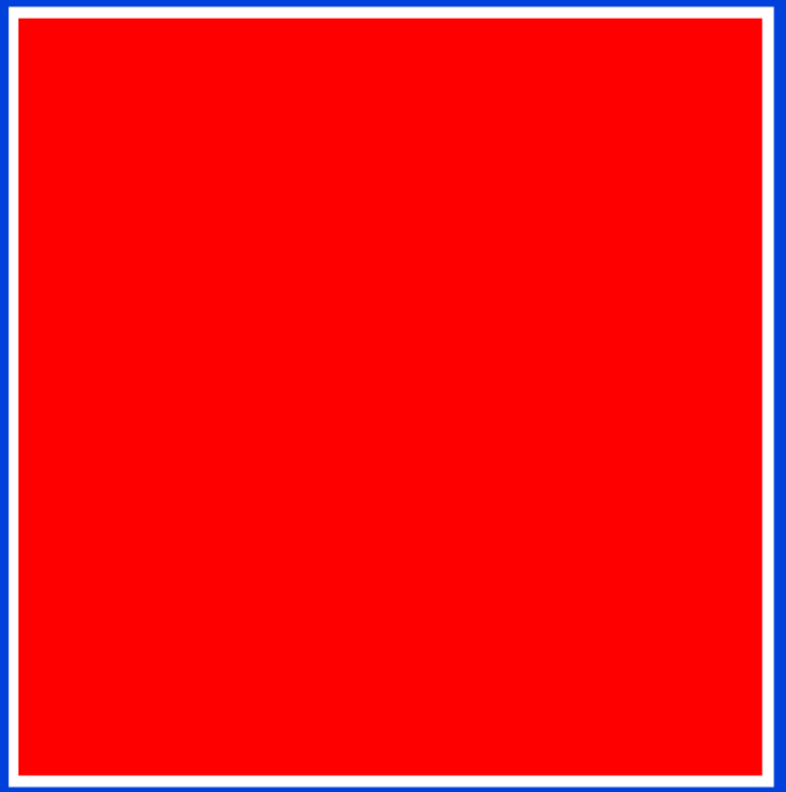
SSGT SA

PRESS

SSGT SA 00:00

VIEW FLAG DATA

PUSH SWITCH TO VIEW HISTORICAL DATA



LOOPS 12

US MARINE CORPS RECRUIT DEPOT SAN DIEGO

FLAG CONDITION

MCRDSD=1

MCRDSD

COM PORT

3

LOCATION=1

S3

SAMPLE RATE

SECONDS 60

CURRENT DATE

Jul 16 2002

CURRENT TIME

18:43:20

LOCATION MONITORED

S3 OFFICE

DB	WB	GT	RH	WBGT	FLAG CONDITION
98.0	85.0	112.0	59.1	91.7	BLACK

TYPE RATE & INITIALS, PRESS SWITCH

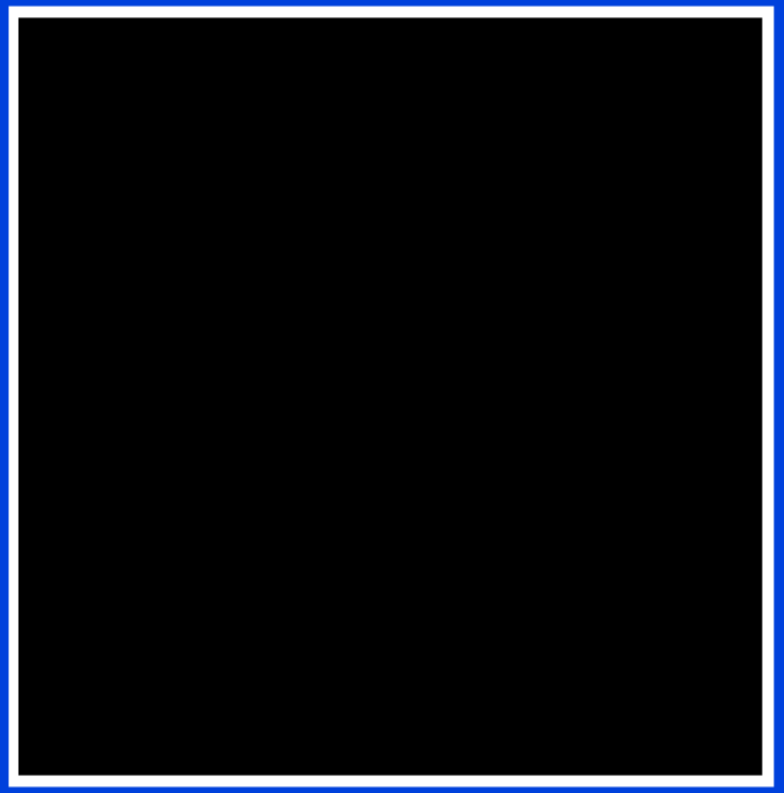
SSGT SA

PRESS

SSGT SA 00:00

VIEW FLAG DATA

PUSH SWITCH TO VIEW HISTORICAL DATA



LOOPS 11